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Plant colonization and succession on embanked sandflats

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SUMMARY

In May 1969 over 5000 ha of tidal sandflats were reclaimed and subsequently designated a "nature area". This thesis describes the results of a research into the spontaneous development of the new vegetation cover. On 5 experimental fields representing the main habitat types, the biomass and the densities of the vascular plants were determined.

The data may derive a more general meaning from the fact that field data on plant demography combined with descriptions of primary successions are rare. Moreover the data may be useful in understanding the functioning of the sandflat ecosystems and in specifying the nature management to be applied.

The sandflats are characterized by fine grained sands, poor in humus and clay, through which lateral ground water movements occur only very slowly, due to the physical features of the terrain, especially its extent and hight profile. In wet periods and especially during winter the ground water remains at the surface. Thus, the very slowly proceeding desalination of notably the lower, siltier areas only occasionally flooded by the reservoir level, resulted mainly from superficial runoff of rainwater. Higher, sandier and well drained areas, such as musselbanks, creek edges and the topmost zone of a height gradient, desalinated more quickly. In these places many plant species were found early on, showing the importance of anemochorous dispersal.

The flats were colonized from the seedbank present, especially *Salicornia* (two species) and to a much lesser extent *Atriplex hastata* and *Suaeda maritima*, all of them annual *Chenopodiaceae*, taking advantage of the suitable saline environment. Attention is paid to migration, to the characteristic aggregation stages and to the logistic increase of these and the subsequent, mainly perennial, species: *Spergularia marina*, *S. media*, *Aster tripolium* and several *Puccinellia* spp. and *Poa* spp.

In the 4th year the density had increased so much, that apparent mortality in *Salicornia* in the period of May to September was at a height of up to 70% on many places. However, in subsequent years a mass mortality was observed in March and April; these seedlings emerged under soaked conditions, did not develop properly fixed roots and succumbed at the time the surface dried. Mortality in the remaining plants was low.

While the numbers were primarily set by this density independent regulation, at the prevailing low N level in subsequent growth root competition occurred especially in the aggregates of the perennial species mentioned.

In several areas and in experiments comprising hoeing, weeding, mowing and addition of nutrients, the plasticity and mortality of the annuals was studied as well as the way in which the annuals were outcompeted by their successors.

The development of the vegetation cover, the initial soil formation after 8 years, and the comparison with more or less comparable areas along the Wadden coast, served as a basis for the prognoses of vegetation development in the different habitat

types on the flats.

On the nutrient-poor higher sands, locally offering a summer drought extreme condition, an increasing accumulation of organic debris occurs. Locally *Salix* (mainly *Salix alba* and *S. repens*), *Hippophaë rhamnoides* and *Calamagrostis epigejos* dominate. After several decennia the decalcification will have proceeded to such an extent, that plant species of oligotraphenic, acid environments will invade. After further pedogenesis these areas gradually will link up with the phytogeographical Wadden District and may capture some elements of the Drenthian District as well.

The lower, siltier and saline areas after 9 years still harbour an annual halophyte vegetation, which persists because of the autumn grazing by waterfowl, which removes the standing crop. However, as desalination proceeds *Puccinellia maritima* and *Spergularia media* will be superseded by *Agrostis stolonifera* and *Phragmites australis*, which also will increase primary production and standing crop. These areas and the fringes of the reservoir lake will gradually link up with the adjacent Hafddistrict.

The new natural area will possibly gain much landscape- and floristic diversity, whereas the ornithological value as a hibernating area will be augmented by its function as breeding area.

The Lauwerszeepolder today presents unlimited opportunities for study of the development of natural communities, and as such presents a challenge for many years to come.

SAMENVATTING

In mei 1969 vielen platen droog, welke de gebied" kregen. In dit van een kwantitatief on van het plantendek. Hie representatief voor de de dichtheden der plant De gegevens ontleneen ee heid, dat populatiedyna primaire successies sch betreffende vegetatie, het doorzien van het fu platen en bij het speci

De platen worden ge sedimenten, waarin teng en fysische eigenschapp beperkt zijn. In natte staat het grondwater to van vooral de lagere, s inundeerde gebieden, is grondse afvoer. Hogere mosselbanken en landaan steilere oevers en bove vroeg vele, met name do De zandplaten werden va koloniseerd door Zeekra mate door Spiesmelde (*Suaeda maritima*), alle *podaceae*), die in enke maximaal uitbuitte. Na teristische aggregatiest de volgende, voornameli en Gerande Schijnspurri Zeeaster (*Aster tripoli* gras (resp. *Puccinellia*

In het 4e jaar was *cornia* in de periode me meest zilte terreinen). sterfte waargenomen in op de drasse platen, on bij droogvallen in mei resterende planten bleo omvang van de populatie hankelijke aantalsregul wortelconcurrentie op, perenne soorten.

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